Embedded Linux
Birds of a Feather Session

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State of Embedded Linux

- For each technology area:

  – Areas of ongoing interest

  – Interesting kernel patches

  – Recent news

Tech areas:

- Security

- RealTime

- Bootup Time

- Size

- Power Management

- Multimedia

Security

- SELinux vs. AppArmour vs. Tomoyo

  - Big fights on kernel mailing list about pathname-based vs. label-based security.

  - Will a pathname-based security system ever make it into the kernel?

- Crispin Cowan (and other AppArmour developers) were layed off from Novell

  - See http://www.news.com/8301-13580_3

Security (cont.)

- Smack just got mainlined

    – SELinux devs got a Linus "smack-down"

Real time - mainline status

- RT-preempt is continuing its march to mainline

- Was following Thomas' timeline until 2.6.21:

    - July 2006: (2.6.18) pifutexes, generic interrupt layer (ARM, PPC), lock dependency validator

    - October 2006: (2.6.19) generic interrupt layer (i386, x86_64, MSI)

    - February 2007: (2.6.21) high res timer / dynticks core code + i386 support

- What's left to mainline

    - threaded interrupt handlers

    - sleeping spinlocks core

    - real time core code (i386, x64_86)

    - .... more architecture support

Tracing

- Kernel Function Trace

  – New maintainer = Nicholas McGuire

  – Really useful to find kernel bootup latency problems

- Markers

  – mainlined in 2.6.24

- Embedded Bootchart

  – Fujitsu, Motorola worked on this

Bootup time

- Fast resume boot techniques are in production
  - e.g. Sony DSC-G1 camera uses snapshot boot
- Faster dynamic linking
  - MIPS prelinking project
  - GNU Hash
- File system mount time
  - Logfs
    - Funding by CELF
  - See Jamboree17 page

Bootup Time

- RC script replacement

- Application time-wasters

  – Dave Jones excellent talk from OLS 2006

    • Paper is at: http://ols2006.108.redhat.com/reprints/jones-reprint.pdf

    • See Dave Jones blog for June 13 for details

    • Dave says "Looks like there's still mileage in that talk after all."

Size

- Application size is now a bigger problem than kernel size!

- Compressed file systems are important
  - Squashfs not getting mainlined
  - LogFS funding

- Application XIP
  - CramFS XIP patches still not mainlined

Kernel Allocator

- SLUB vs. SLAB vs. SLOB

- In 2.6.23 both SLUB and SLOB received some updates. Nick Piggins wants to know what the size difference is between SLOB And SLUB.

- SLUB is on a track to replace SLAB

- Christoph Lameter tried to remove SLOB, but was rejected
  - We need to show value of SLOB. If you have test results, please send them to LKML
  - My results: 150K difference in free memory available after boot

Linux-tiny

- Some big reduction patches already integrated (about 2.6.11)

- New maintainer: Michael Opdenacker

- Patches for 2.6.23 available now

- Some patches to be mainlined soon

Kpagemap

- System-wide memory instrumentation
- Allows for detailed look at system memory utilization
- Queued in mm
- Matt Mackall still working on resolving some issues

Size (cont.)

- uClibc

  – Good size, but not well-maintained

  – Could be a refuge from LGPL v3

- LSB profile for embedded

  – Discussed at Collaboration summit

Power Management

- Still lots of problems

  - Frameworks have been dificult to mainline

- Lesswatts.org

- New utility: powertop

  - Shows problem timers

  - Shows ACPI state info

    - Would be nice to get something similar working for embedded platforms

Multimedia

- Linux Sound currently a mess

  - Too many competing, incompatible sound systems:

    - JACK, ALSA, OSS, ESD

    - CELF recommends to use and support ALSA

  - See presentation by Lennart Poettering from OLS:

    - https://ols2006.108.redhat.com/2007/Reprints/poettering-Reprint.pdf

- Gstreamer gaining traction in handheld space

License

- Kernel safe for now, what about libs??

- Glibc 2.6.1 Release note (http://sourceware.org/ml/libc-announce/2007/msg00001.html)

  The 2.6 and 2.6.1 releases of the GNU C Library are licensed under the LGPL version 2.1, and GPL version 2.1 for the non-library programs included, or any later version. This means you are free to redistribute this version under the terms of the LGPL version 3 or the GPL 3, as well under as the version 2.1 terms of the 2.6 release. We expect that the next non-bug-fix release of the C Library will migrate to a newer LGPL version

Distributions

- OpenEmbedded

    – Still moving along, CELF has funded some work

- Embedded Debian

    – Don't know status

- Fedora for ARM

    – New project

Interesting Products

- Sony PS3

- Sony HD Camcorders and Digital Still Cameras

    - 2 second cold boot to application active

    - DSC-G1 = a sweet product (if I say so myself)

        - Wireless, with DLNA

- Motorola phones

    - Linux phone coming to US by end of 2007

New Organizations

- OSDL + FSG = The Linux Foundation

- LiMo = Linux in Mobile organization

- GMAE = Gnome Mobile and Embedded

Projects

- OpenMoko

- Ubuntu mobile

- Maemo

- Mobilinux

- ARM Initiative = GNOME customizations for ARM??

Embedded Wiki

- CELF is building an Embedded Linux wiki

  – http://elinux.org/

Open Discussion